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| **Title and code** of the subject: **Water resource protection and water damage prevention , MTMVG7013A** | **ECTS Credit: 4** |
| **Type** of the subject: compulsory | |
| **Ratio of theory and practice:** (credit%) **50/50** | |
| **Type and number of classes per semester**: 28 hour(s) lecture and 28 hour(s) practice per **semester**  Number of classes per week: 2+2 | |
| **Type of exam**: exam & practical course mark | |
| **Subject in the curriculum:** semester 2 | |
| Preliminary requirements:- | |

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| **Summary of content - theory**: |
| Course objectives: The objective of this course is to develop an understanding of the problems related to water resource management and water damage prevention. This course is based on an integrated approach to the water resource protection, flood control, water pollution prevention and erosion control. The students learn the main principles of EU flood directive and have knowledge about European experience in flood risk management.   1. The concept and types of groundwater. The basic concepts of hydrostratigraphy, hydrostratigraphic classification 2. Characterization of groundwater. Classification of aquifers by formation 3. Groundwater contaminants, Aquifer vulnerability and sensitivity 4. The supply of bank-filtered waters from surface and groundwater. The bank-filtered water recharge of surface and ground water. Factors affecting the quality of bank-filtered water 5. Concept of water base and water base protection. Main areas of activity for water base protection. Defining the protection zones of the water base. Legally Prohibited Activities in Zones A, B and C. 6. The concept of water resources and protection of water resources The main fields of water resource protection activities 7. The types of floods and floodplains. The causes of floods 8. The flood risk assessment and modelling. 9. The technological methods of flood protection. 10. The oil pollution treatment. The Options for Minimizing Environmental Impacts of Freshwater Spill Response 11. The types and causes of excess water. The excess water control. The lowland drainage 12. The erosion control and the hillside water management. 13. The water pollution prevention. The wastewater treatment. 14. The eutrophication control, prevention, and treatment. |
| **Summary of content - practice**: |
| Skills to be learnt: the participant should be able to: understand and explain the main principles of flood risk management, understand the Hydroinformatics tools available for flood risk management, understand and explain the main principles of flood forecasting and warning and uncertainty issues associated with flood forecasts.   1. Introduction, Quizzes, Definitions & Explanations 2. Subsurface Water Quizzes & Explanation 3. Calculation of Flow Characteristics 4. Energy Principles. Application of Energy Principles in Flood Protection 5. The Orifice Equation Application for the Dam Breaking 6. The Weir Equation for Regulating High-Return Event Flows Overtopping Dams 7. Flood Risk Estimation Quizzes & Explanations 8. The Weir Equation for the Rectangular Weir 9. Uniform Flow of Concrete Trapezoidal Channel 10. Summary and Control Quizzes 11. Critical Depth of a Grassy Channel 12. Water and Nutrient Exchange of Lakes 13. Manning Formula for Discharge 14. Control Measures of Water Pollution. Quizzes and Explanations |
| **Literature, handbooks in English** |
| 1. The theoretical and practical materials of the course are available in pdf and ppt format.   Recommended:   1. Options for Minimizing Environmental Impacts of Freshwater Spill Response. National Oceanic Atmospheric Administration, Hazardous Materials Response & Assessment Division, American Petroleum Institute, September 1994 |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**  * The student knows the agricultural water management technologies and procedures, and some of their IT solutions. * The student has mastered the design and implementation methods of water damage prevention systems.  1. **Skills:**  * The student is able to develop and implement problem-oriented solutions in his/her fields of expertise. * The student is able to interpret and apply the legislation related to his professional activity independently * The student is able to analyse the different problems of the given field, to explore general and special relationships  1. **Attitude:**  * The student is committed to environmental protection and sustainable agriculture. * The student is committed to solving problems on a professional basis. * The student is thoughtful and his/her opinion is based on professional aspects.  1. **Autonomy and responsibility:**  * The student has autonomy in developing comprehensive and specialized professional solutions, representing professional aspects. * In the knowledge of the problem, the student chooses the most appropriate environmental, water damage and remediation technologies. |

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| **Responsible lecturer: Dr. Elza Kovács** |
| **Other lecturer(s): Dr Pregun Csaba PhD** |

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| **Terms of course completion:** |
| 1. Completing assignments / exercises |
| **Form of examination:** |
| Written and/or verbal |
| **Requirement(s) to get signature:** |
| The implementation of the practices.  You can only miss the practice in accordance with the University of Debrecen Study and Exam Regulations. Active participation in exercises.  Calculation exam task. |

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| **Exam questions:** |
| 1. Describe the water resources and water uses of the earth! 2. Characterize the water resources in terms of quantity and quality! 3. Characterize the surface lentic waters! 4. Characterize the surface lotic waters! 5. Characterize the subsurface waters! 6. Characterize the dynamic and static water resources! 7. Describe the basics of water resource management! 8. Provide examples of operating and prospective drinking water bases! 9. Give some details of the methods of subsurface water protection! 10. Describe some technological methods of groundwater protection! 11. Describe the European Union’s water policy and the content of the water framework directive! 12. Describe the concept of water damage and its types! 13. Characterize the types of floods and floodplains 14. Describe the types and causes of floods! 15. Describe the flood risk assessment! 16. Describe the types and causes of excess water! 17. Describe the types and causes of drought! 18. Give some details of the common technical flood protection solutions! 19. Give some details of the design of flood protection levee/dike! 20. Give some details of the sizing of a canal! 21. Describe the types of erosion and erosion protection solutions! 22. Describe the operation of the inland water protection unit! 23. Describe the protection zones of water bases and the prohibited activities there. 24. Give details of water management system! 25. Describe the river corridor and watershed management! 26. Describe some options for minimizing environmental impacts of freshwater spill response! 27. Give details of the methods of flood protection 28. Describe dam breaks. 29. Characterize ice jams and ice flood! 30. Characterize mud flows! 31. Characterize flash floods! 32. Characterize the functions of flood storage reservoirs! 33. Characterise the types of erosion! 34. Give some details of erosion control! 35. Give some details of hillside water management! 36. Give some details of land drainage! 37. Give some details of excess water control! 38. Characterize the main stages of wastewater management! |